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BUILDING COMMISSIONING

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CASE STUDY

WASHINGTON CORRECTIONAL CENTER FOR WOMEN — ENSURING BUILDING PERFORMANCE OF NEW HOUSING UNIT



Cell doors and pipe chases

In 2001, the Washington State Department of Corrections (DOC) built a new housing unit for women offenders who have special medical and psychological needs. The building is located on the grounds of the Correctional Center for Women (formerly known as Purdy Treatment Center) in Gig Harbor.

The DOC, in conjunction with the Department of General Administration's building commissioning program, hired Casault Engineering to commission the HVAC and low-voltage systems. DOC's primary purpose for commissioning the project was to ensure adequate whole-building performance.

While the commissioning process was exceptionally successful in identifying and resolving potential operational deficiencies, there were several frustrations and "lessons learned" during the project close-out.

COMMISSIONING QUICK FACTS

Building Name	Washington Correctional Center for Women Special Needs Unit
Location	Gig Harbor, Washington
Project	New building construction
Commissioning Scope	HVAC-mechanical system. Low-voltage security and fire alarm systems.
Building Size	55,500 sq.ft.
Total Construction Cost	\$13,509,755
Total Commissioning Cost	\$135,900
Commissioning as % of Construction Cost	1.0%
Commissioning Cost per Square Foot	\$2.45
First-Year Cost Benefit	\$10,300
Annual Energy Savings	\$7,900 per year

PROJECT PARTNERS

**Washington State
Department of General
Administration**
Roger Wigfield

**Washington State
Department of Corrections**
Joy Wellman

Casault Engineering
(Commissioning Agent)
Rick Casault

Integrus Architecture
Larry Hurlbert

M.A. Mortenson
(General Contractor)
Bill Kent and Tom Aura

MW Engineers
(Mechanical Engineer)
Jason Smith

"I would like to thank the general contractor [and subcontractors] for their outstanding response to issues that arose and were immediately corrected, and the Commissioning Agent for his relentless attention to detail."

Joe Herwick, Plant Operations
Washington Correctional
Center for Women

PROJECT SCOPE OF WORK

Among the mechanical systems included in the commissioning scope of work were:

- HVAC controls and piping
- Air handling units, unit heaters, fan coil units
- Exhaust fans and air-to-air heat recovery systems
- Steam equipment, including condensate pumps and heat exchangers

- Testing/adjusting/balancing (TAB) verification

Low-voltage systems included in the commissioning were:

- Security door control and monitoring
- Central security control graphic panel
- Closed circuit TV surveillance
- Fire alarm

ISSUES IDENTIFIED

Among the HVAC system issues identified and resolved were:

- Direct Digital Control (DDC)—At the Commissioning Agent's (CA) suggestion, the control logic for sequencing operation was developed and approved early in the project. This avoided subsequent misunderstandings, and helped in planning functional performance tests of the system.
- Test ports/instrumentation—The CA and design engineer developed HVAC specifications requiring test ports and instrumentation that will enhance monitoring and troubleshooting of the system in the future.
- Outside air dampers failed—Dampers remained open when air handling units failed, resulting in a potential for coil freeze during low temperature failure. This was resolved by installing the equipment differently.
- Condensate receiver tank not bolted down—This was discovered during functional performance tests; the contractor added bolts.

Fire and security alarm issues identified include:

- Fire alarm control panel—An uninterruptible power supply was originally intended to feed the control panel, but during functional tests was not yet connected. After discussion with the project's engineer, the plan was revised to have it fed by the emergency generator.
- Security system—Performance tests found more than 50 deficiencies including corridor doors that were not sending an alarm when open, cell door positioning switches that needed adjustment, and problems with closed circuit TV cameras and recording capability.

ENERGY IMPLICATIONS OF COMMISSIONING

Several HVAC energy saving opportunities were identified during the commissioning process:

- During system design, the CA suggested specifying a reset schedule for the heating water supply temperature setpoint. This will reduce energy consumption and make the coil flow rates more controllable under low heating load conditions.
- Unit heaters were observed to be operating without an on/off deadband between setpoints, creating the potential for too-frequent cycling. The contractor revised the controls to include a deadband.
- During performance tests, it was found that the hot deck was transferring heat to adjacent bypass deck entrances. This was resolved by installing insulated shelves between the hot and cold decks.

ADDITIONAL BENEFITS

Several issues discovered during commissioning helped avoid potential equipment damage. For example, back draft damper end switches for two major exhaust fans had not been installed and had to be retrofit. Without this safety feature, there was potential for the fans to try to operate against a failed damper, damaging ducts and overloading the fans.

A focused commissioning team effort during design and the early stages of construction paid off with final functional performance testing that went quickly and smoothly with very few failures. The CA was considered not as a watchdog, but as the leader of a valuable performance assurance process that involved, and was intended to benefit, everyone associated with the project. And, by avoiding operational deficiencies, the project budget and schedule benefited!

LESSONS LEARNED

Until the closeout phase, this commissioning process was exceptionally successful. Contributors to this success were:

- Commissioning began during the design phase.
- Bid documents included detailed, biddable, and enforceable commissioning specifications.
- Specifications required the General Contractor to provide a designated Commissioning Coordinator.

Unfortunately, as the project neared completion, the CA was not consulted before the contractor was awarded "Substantial Completion" and moved their offices from the site. This pre-empted some commissioning closeout procedures that had been specified, compromising the CA's ability to recommend acceptance of the HVAC and security systems. While the contractor has verbally indicated that most of the issues identified during performance testing have been remedied, the CA does not have official documentation of the remedies.

PROJECT BENEFITS

- \$10,300 in first-year cost benefits (such as fewer contractor call-backs, reduced change orders, problems corrected at design stage, etc.)
- \$7,900 in annual energy savings
- Issues identified during design phase saved money and time during construction phase
- Commissioning team addressed functional performance issues early in process—thus many issues discovered during performance testing were minor and could be resolved on the spot
- Issues identified helped avoid potential future equipment damage

"Commissioning can be functional or helpful—this was both. The owner got a better building and the facility staff got a better understanding of the operation of the building."

Jason Smith, P.E.
MW Engineers



Reviewing plans in the construction trailer

FOR INFORMATION ON WASHINGTON'S COMMISSIONING PROGRAM



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WHAT IS COMMISSIONING?

Building commissioning is a systematic and documented process of ensuring that building systems perform according to the design intent and the owner's operational needs.

Commissioning is used in both new construction and existing buildings.

Commissioning:

- Provides a better environment for occupants
- Reduces indoor air quality problems
- Reduces occupant complaints
- Reduces contractor call-backs and warranty issues
- Reduces energy consumption and operational costs

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